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SEYCHELLES

ANNUAL REPORT

ON

AGRICULTURE AND CROWN LANDS

for the year

1912

VICTORIA

PRINTED AT THE GOVERNMENT PRINTING OFFICE.

1913.

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AGRICULTURE

AND

CROWN LANDS

ANNUAL REPORT

1912.

I.

Expenditure, Receipts, Sale of plants.

	Rs.	c.
Sale of produce	1,923	74
Rents of Crown Lands, exclusive of buildings	16,616	50
Royalty on Guano	42,343	68
Export duty on Guano	21,142	23
Total Rs ...	82,026	15

Total expenditure under Agriculture and Crown Lands ... Rs ... 23,127 04 including the Curator's visit of investigation to S. India and Ceylon.

The principal plants and seeds sold were the following :—

Palmyrah nuts	27
Sweet potatoes from Antigua ...	133
Eddoes from Antigua	43
Butter tree *(Pentadesma butyracea)* ...	28
Para rubber *(Hevea Brasiliensis)* ...	736
Artocarpus rigida from Singapore ...	10
Eugenia Brasiliensis *(Brazil Cherry)* ...	8
Palm Oil *(Elaeis guineensis)*	15
Azadarichta indica	12
Casuarina equisetifolia	1,996
Juffna Mangoes	5
Rambutan *(Nephelium lappaceum)* ...	3
Cynometra cauliflora	5
Sandoricum indicum	6
Bouea macrophylla	5
Pine apples suckers (*West Indian varieties*)	16
Garcinia Mangostana	4
Eugenia Grandis	3
Andropogon flexnosus (*Cochin lemon grass*)	1,147
Cassava (*Manihot Ultilissima*) ...	24
Ornamental plants	452

79 tins of various seeds were forwarded to other Botanic Stations and Institutes.

II.

Condition of the garden sticking species introduced flowered and fruited.

Among the plants which flowered for the first time may be mentioned:—

Bougainvillea lateritia
do glabra var Sanderiana
Peltophorum ferrugineum
Antigonon leptopus albiflora
Mussaenda erythrophylla
do frondosa
do lutea
Gmelina asiatica
do hystrix
Clitoria double bleue
Gardenia longistyla
Allamanda grandiflora
Latana nivea
Clerodendron macrosiphon
Euphorbia pulchrum
Plumbago alba
Castilloa elastica, &c., &c.

Among economic plants special attention has been devoted to the propagation of *Cola* and to the grafting and inarching of fruit trees.

Cola nuts were introduced from Ceylon in 1903 and the plants fruited abundantly in 1912. Three specimens had been introduced probably from Kew at a remote date and were discovered in the jungle at Government House in 1908. One of these specimens although grown in poor soil produced 2000 nuts this year showing that under favourable climatic conditions this tree is quite capable of producing a large crop in Seychelles. A few other trees are also reported to have done well at Anse-aux-Pins whence a few planters applied for information as to the curing of the nuts. All these trees belong to the species now known as *Cola nitida rubra* and it is fortunate that no better variety could have been introduced. A few nuts were offered to the Ashanti political prisoners who most readily accepted and consumed them. Most of the other seeds were kept for propagation and distribution.

It appears that there is some future for *cola* planting and as the tree grows best in warm and wet localities near the Equator, some advantage might be taken of this consideration in Seychelles. It is not likely that the article will be overproduced in the near future and the export from the tropics to Europe and America has already reached 1000 tons. In West Africa the consumption reaches and even exceeds 2000 tons. The price (*5d* for dried nuts and *2/* for fresh nuts) is likely to rise as the composition of cola nuts is just becoming known. They are found to contain besides cafein, a substance allied to tannin which forms with cafein a soluble composition of powerful stimulating properties.

The tree in Seychelles is remarkably free from blight except *coccidae* like *Icerya Seychellarum* which only attack the pods at the time of ripening without damaging the nuts inside. This tree is well adapted to the local cultural methods. It stands shade and can be planted in forest clearings and alongside river reserves but it should be mentioned that under unfavourable conditions the tree remains sterile or has a tendency to produce male flowers only.

With regard to the budding and inarching of fruit trees, the seedling-inarch method inaugurated by the United States Department of Agriculture was found successful with mangoes and oranges. Young seedlings of the common varieties of mangoes and bigarades (*citrus limonellus*) were united without difficulty to branches of Bombay mangoes and Washington navel oranges. Ordinary shield budding was also found successful with oranges but the system of patch budding failed with mangoes probably because the seedlings used as stocks had suffered considerably from scale insects. All these experiments will be repeated as it is important to establish fruit trees of good quality in the Colony. It is also contemplated to make a selection of our best *Spondias Cytherea* or *Mangifera* (*fruits de Cythère*) the rainy season having freed most of these fruits trees from the attacks of scale insects which for many years had nearly deprived the natives of their favourite fruit. Many varieties are nearly as large as avocado pears and those which possess small stones make really good dessert fruits.

III.

Distribution of information on Agricultural matters.

Three reports have been published this year (1912) one on my mission to Ceylon and S. India, one on the diseases of Coconut trees in Seychelles and the last on the Scale insects which attack cultivated plants in the Colony.

Many estates were visited and information given on the spot to various planters at Praslin, Curieuse, Félicité, Anse Royale, Anse Forbans, Anse Bougainville, Anse-aux-Pins, Bel Ombre, Beau Vallon, Anse Etoile, Anse Boileau, Grand'Anse, Port Glaud, and Port Launay.

Much more attention is paid to the coconut diseases and the beetle is becoming more generally known to planters. It is proposed to have diagrams drawn and specimens mounted in Europe for distribution to the public.

IV.

Plots Experiments.

Green Manuring and other Leguminous crops.

The following plants were experimented with during the year in order to ascertain what cheap nitrogenous fertilizer could be obtained with the aid of those plants which fix atmospheric nitrogen into the soil.

It is not generally known that about three tons of dried material can be produced on one acre by growing plants like *Tephrosia candida*, the above quantity representing as much as:

100 lbs of Nitrogen
24 do. Phosphoric acid
48 do. Potash
88 do. Lime

and that the leaves and twigs of this plant contain more nitrogen than the best cattle manure.

Except in soils of good composition and containing lime in sufficient quantity *Tephrosia candida* is difficult to establish except by manuring it but, when once established, the young seedlings grow vigorously to a height of 5 or 6 feet forming a thick covering and a large amount of green manuring material. The plants set out in hedges between lines of coconut trees do not prevent the picking of the nuts which are easily detected owing to the lower part of the hedges being devoid of leaves to a height of about 18 inches.

The other *Tephrosias*, viz:

Tephrosia purpurea and *Tephrosia Hookeriana* produce a much less abundant crop of green leaves and they are quite as difficult to establish, being the prey of mealy bugs like *Tephrosia candida* when the soil is poor. The local name for *Tephrosia candida* is *indigo sauvage* which is a name also applied to other varieties of the industrial indigo plants which one sees subspontaneously growing in Seychelles. *Tephrosia candida* is however easily distinguished owing to its large ornamental white flowers whilst the other indigo possess inconspicuous flowers.

Another genus of plants which was tried with some success is *Crotolaria*. *Crotolaria juncea* was found to be very hardy and free from blight but it failed to establish itself like *Tephrosia candida* and has to be sown in beds before being set out. The crop of leaves is moreover small the plant producing straight unbranched stems which are being used for making fibre in S. India. This plant is worthy of attention although the growth of leafage is sparse because it spreads quickly and flowers within two months producing an abundant crop of seeds.

Crotolaria retusa was found to produce a much better growth of leafage and to cover the soil in the right manner but this plant like the other three following *crotolarias,* viz : *C. incana*, *C. verrucosa* and *C. striata* is very susceptible to the attack of *Aphis* insects and will not grow well during periods of drought. Another *crotolaria* (unnamed) with tomentous leaves was introduced from Le Réduit, Mauritius, and was found to grow more vigorously than all the other *crotolarias.* It has not yet seeded. *Crotolarias striata* when not attacked by *Aphidae* is the most promissing of the *crotolarias* or cascavelles as these plants are named in the Colony.

A new *Tephrosia* and *Sophora tomentosa* were also received from the Director of the Agronomic Station of Mauritius but these plants grow more slowly than the *crotolarias* and do not cover the ground as well as *Tephrosia candida* which is the best of green dressing plants grown as yet in the Colony.

Soy beans were tried in garden soil but they only grew to a height of one foot and then flowered and fruited profusely. They were free from the nodule organism that lives in symbiosis with the other leguminous plants. The seeds were received from Mr Stuart R. Cope and were derived from Manchurian selected varieties. A new trial will be made with the same seeds mixed with soil on which the plant had been successfully grown by Mr Cope. It is also proposed to introduce other varieties of Soy beans from Java and India. This plant deserves a place in all gardens of Seychelles on account of its delicious beans but I do not think it will ever be used as a green dressing plant.

Many varieties of Lyon bean and Bengal beans (*Stizolobium*) and a great many species of cowpeas (*Dolichos*) were tried with success but the climbing habit of these plants and their short duration make them unsuitable as a green dressing in orchards. A very interesting variety of cowpea with erect non-trailing stem was received with many others from the United States Department of Agriculture but it failed to grow vigorously except in garden soils where it deserves a good place.

Yantias, Taros, and Dasheens.

Another experimental plot was started this year for the purpose of testing the qualities and defects of the numerous economic *aroids* locally called Arouilles some of which are subspontaneous in the marshes of Seychelles and others were introduced by this Department in 1908 from W. Africa, in 1910 from the West Indies, and in 1911 from India and Ceylon.

All these ancient varieties are used by the natives who eat only the tubers and rootstocks while the Indians coolies now residing in Seychelles eat also the tender leaves as a vegetable. As these plants grow in soils which are much too wet for other crops it has been long thought advisable to introduce new varieties in order to increase the food resources of the native population in places where they are unable to grow cassava or sweet potatoes. It was also found necessary to get another material for stock feeding, especially pigs and poultry which have been deprived of their usual food, poonac or coconut oil refuse, since the exportation of nearly all the coprah made in the Colony.

It was found that the Yantias or tanniers (*Xanthosoma Sagittifolium*) were almost entirely missing in the Colony and as they furnish the largest yields, no less than eight of the best varieties were introduced from Dominica and one from Lagos.

The local variety of Yantia is called *Via* and the rootstock and small tubers are used for stock feeding. No natives care to eat it.

Among the newly introduced varieties, three have been found up to now to produce excellent good shaped tubers which are of the size of potatoes and completely underground. These three plants grow to an enormous size. The other varieties are less prolific but will be tested under other conditions of growth.

Among the taros and dasheens (*colocasia antiquorum*) there were three varieties already existing, one called Songe blanc with green leaves, the second Arouille with black greenish leaves and a purple spot in the middle, and the third possessing small blackish leaves which are eaten as a vegetable by the coolies but producing no edible tubers.

The Songe blanc (*a taro*) possesses no tubers and the rootstock is very seldom consumed by the natives who eat the young leaves. It is however used in Dominica as among the varieties newly introduced the same plant was included in the list. The Arouille is a dasheen producing numerous tubers, both tubers and rootstock being consumed by the peasant proprietors. In a few localities I have seen this variety grown and producing enormous crops in marshes where abundant deposits of guano once existed. It seems to respond to fertilizers in a marked degree. It is the most known variety grown in the Colony.

In order to remember the different names more easily, it should not be forgotten that the Yantias leaves are always arrow shaped or sagittate exposing the attachmemt of the petiole. In the dasheens and the taros the blade is peltate or shield shaped, i. e, the petiole is attached to the under side of the blade.

Among the varieties introduced from India the tubers were found to be root like, slender and much smaller than the tubers of the West Indian varieties which are nearly spherical or obovoid. It is proposed to introduce other W. Indian or American varieties.

The W. African varieties flower freely in this Colony, the spathe being yellowish white. It possesses also very good round tubers which can be easily snapped off from the central rootstocks.

V.

Meteorological Observations.

The following tabulated statement shows that 1912 was the wettest year on record for the last 8 years and that nearly 30 inches more of rain fell during the year than in 1911. As explained last year the rainfall from June to June is also given because the greatest monthly rainfall occuring either in December or in January, it often happens than one year is drier than the other owing to the heavy rains beginning in December instead of January. The growth and crop of vanilla, rubber and coconuts are also regulated by the rainfall which commences in November or October and ends in April although the flowering of Vanilla is also dependant on the state of the weather which should be dry in July, August and September to ensure a good flowering. But as seen from the shortage of crop in the last five years it cannot be denied that even this precious orchid is benefited by a general heavy rainfall during the whole of the year with a spell of drought at the time of flowering. The rainfall during the last months of the year 1912 has also exceeded the average for the last six years and it is to be hoped that after seven years of drought we have entered upon an equal period of abundant rainfall to the great benefit of the Colony. In years of shortage of rains the plants not only suffer owing to the shallowness of the soil which is overheated but they are also more severely attacked by scale insects on account of the disappearance by drought of the fungoid parasites which keep in check the insect pests. The favourable influence of rain was shown this year (1912) by the flowering and fruiting of such trees as oranges, limes and spondias (*golden apple* alias *fruit de Cythère*) which had not flowered or fruited for the last five years owing to drought and insect pests.

Meteorological Observations.

Temperature			Hygrometer		Rainfall	Rainfall from June to June.			
Daily average per mensem	Maximum	Minimum	Wet Bulb	Dry Bulb	*Total Monthly*	——	1910–11	1911–12	1912–13
January	82.8	76.2	77.2	80.7	29.69	June	1.28	1.94	7.13
February	84.3	77.7	77.1	81.5	18.70	July	1.66	1.01	4.53
March	85.0	79.4	77.3	83.3	3.19	August	1.51	0.81	0.76
April	85.6	79.3	78.7	83.7	5.56	September	2.66	7.00	5.08
May	85.9	78.9	78.0	83.8	9.18	October	0.03	7.00	4.37
June	82.9	77.5	76.4	81.1	7.13	November	9.00	14.15	4.28
July	80.5	75.3	74.1	78.9	4.53	December	18.67	5.94	13.51
August	80.6	76.0	73.8	79.0	0.76	January	11.15	29.69	
September	82.2	76.7	75.0	80.3	5.08	February	15.27	18.70	
October	82.9	76.5	75.7	81.1	4.37	March	4.93	3.19	
November	83.1	76.4	75.5	81.7	4.28	April	3.83	5.56	
December	82.9	75.7	76.0	81.0	13.51	May	4.18	9.18	
	83.2	77.2	76.2	81.3	106.00		74.17	104.17	

VI.

The Coconut Industries.

The following nuts were gathered in 1912 as compared with the crops for 1905—1911.

—	1905	1906	1907	1908	1909	1910	1911	1912
Nuts exported in nature ...	551,135	381,954	601,560	479,849	91,907	129,154	445,795	182,227
,, converted into oil ...	9,915,496	7,762,080	1,786,160	4,285,578	2,016,040	394,960	209,448	698,400
,, ,, ,, coprah	2,077,019	5,685,860	13,655,683	11,463,438	16,208,891	18,597,045	18,131,015	19,153,393
,, ,, ,, soap ...	2,450,599	1,243,571	1,672,006	2,969,246	1,846,040	969,542	408,969	839,104
., consumed locally ...	4,000.000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
Total ...	18,994,249	19,073,465	21,715,409	23,198,111	24,162,878	24,090,701	23,195,227	24,873,124

The above table may serve to show to what extent the coconut industries have been modified in recent years. In 1905 more than half the crop was converted into oil sold locally or exported to Mauritius. The oil industry has steadily declined from 1905 to 1910, and the nuts required by the coprah manufacturers have risen in number from 2 millions in 1905 to over 18 millions in 1910. The year under record (1912) shows the greatest number of nuts (19 millions) converted into coprah, and also the highest total crop (nearly 25 millions) ever produced in the Colony. It is also worth noting that the soap industry is also declining at the same time as the oil industry, no other oil than coconut oil being produced in the Colony for soap manufacture. To what extent the coconut industries have been modified in recent years may be gauged from the fact that in 1905 the price of 1000 nuts amounted to Rs 20, while it is at present more than double, viz : Rs 40 to 50. The only drawback is the difficulty experienced by the peasant proprietors and by the poorer classes in obtaining a supply of poonac (residue of coconut oil) which was formerly so useful to them as food for cattle, horses, pigs, and poultry. This has an important bearing on economic conditions in the Colony, especially when the shortage of poonac is coupled with the deficiency of oil as a raw material for soap manufacture. I think that the only way to get out of the difficulty would be to grow, in localities unsuited to the coconut tree, another oil plant such as palm oil, which produces nuts containing a large percentage of good saleable oil and a residue (poonac) which, although inferior to coconut cake, may yet serve as food for cattle, pigs and poultry. The palm nut oil would serve equally well to replace coconut oil in the manufacture of soap, and full advantage would still be taken of the high prices for coprah on the European market by not attempting to keep larger proportions of the coconuts for oil manufacture.

In connection with this, it has already been ascertained that oil palms grow well in this Colony, where palms form a considerable part of the native jungle. Seeds have already been introduced, and the first plants have come into bearing in the fifth year. New varieties were introduced this year (1912) from Lagos, and a request to obtain seeds of the best variety (*Lisombe*) has been made to the authorities of Southern Nigeria.

I do not think it would be wise to leave the oil and soap industries to their fate, because there are very few industries flourishing in the Colony, where so many hands are unemployed and where the population is increasing so rapidly. The establishing of new industries, besides affording good object lessons and training work for the coming generation, would relieve the Colony from the singular position of exporting its poonac and being at the same time obliged to import the same or a substitute at great cost, for the proper feeding of the domestic animals and cattle.

It is also important to recollect that coprah is sold at higher prices every year, and many things go to show that the rival (Soy bean) oil will not easily replace the excellent edible fats produced from the coconut palm. Efforts are however being made in this direction and the cultivation of Soy beans is taken up in several countries in the tropics, and the creation of new and improved varieties contemplated.

The coconut planters must not, for this reason, remain idle. It is a satisfactory sign that the manuring of coconut palms on modern lines is being contemplated by the larger proprietors and Companies. To encourage this movement, the Government has decided to place free of charge a certain amount of chemical manures, especially "nitrolim" at the disposal of planters who intend starting methodical manuring on experimental plantations. The scientific manuring of coconut palms is likely to be the most beneficial agricultural improvement in this Colony for many years to come. Phosphates are easily obtainable from the guano islands at a very low price (Rs 20 per ton). Green manuring can help to produce nitrogenous fertilisers at a cheap rate, and it is hoped that fish guano will be manufactured when the fishing industries have developed, in order to place cheap nitrogenous manures at the disposal of planters. Potash salts, especially sulphates, are the only expensive chemical manures which planters will have to purchase, but with the amount of seaweeds deposited on the beach in all localities at the turn of each monsoon and during heavy swells, there is no reason why potash should not be also cheaply obtainable in the near future.

In the Bulletin of the Imperial Institute for October 1912 it is shown that various seaweeds have been found to contain, when dried at 103 ° C., 25·7 o/o of chloride of potassium and 0.15 o/o of iodine. It is reported in that article that the weed being dried in the air first, and then in ovens, about 50 o/o of the total potassium chloride, which is in the form of an effloresced salt, can be removed by shaking.

It is fundamentally important that chemical manures be obtained at a low cost, because the majority of planters cannot afford to buy expensive ingredients. But the development of the coconut industry is familiarly recognised here to depend on the proper manuring of the plantations. These plantations show signs of chlorose and other root diseases characteristic of impoverished soils, and there is no doubt that proper manuring is the remedy, because it is well known that in moist and warm countries like Seychelles, the effect of manures on vegetation is singularly active.

VII.

The Vanilla Industry.

The crop of Vanilla fell to 8 tons, the lowest on record since 1895. The declared value per kilo amounted to Rs. 19, a much better price than any realized since 1904 when it was as low as Rs 7 per kilo.

During the year under review with its favourable rainy weather and high prices a great change was noticed in the cultivation of Vanilla and in many localities where 7 years drought had caused abandonment of the industry, new plantations are being made and most of them on much better principles.

It is plainly realized in this Colony that the culture of Vanilla in spite of its being dependent more on weather conditions than on cultural treatment, is much in favour among all classes of the community.

A great step has been made in the right direction. Under the influence of the heavy rain, old vines more or less abandoned put forth new growth and many planters have adopted the plan of heavy mulching with weeds with alternate layers of lime and earth.

As far back as in 1908, the experimental plantations at Capucin showed the following composition of the ash of the Vanilla vines in full growth.

	No Manure.	*Manured.*
Silica	1.96	1.37
Chlorine	3.91	4.00
Sulphuric acid	0.62	0.69
Phosphoric acid	1.95	2.74
Lime	27.57	35.54
Magnesia	12.10	10.32
Potash	18.47	12.87
Soda	1.81	3.77
Oxide of iron	2.10	1.50
Manganese	0.26	0.30
Carbonic acid, &c	29.23	27.29
	100.00	100.00

The manure applied consists of lime (4 kilos of broken coral per vine), guano (5 kilos of rock phosphates per vine), Potash and Nitrogen were supplied as chloride of potassium and nitrate of Ammonia in weak solutions 1/10000 once a week. The lime and guano were only applied once in 5 years.

In the different plots which consisted of 4 to 6 vines grown on dead Capucin wood the following analyses show such an individual variation in the composition of the vines that unless experimental plots are made large enough to cover 1/5 or 1/10th of an acre per plot, it will be difficult to determine exactly the influence of manuring on the composition of the vines.

Experiment on the manuring of Vanilla.

	8	9	10	11	14	15	16	17
Dry matter	8.87	8.64	8.20	12.30	10.60	10.03	10.60	10.20
Ash o/o of dry matter.	11.90	13.30	13.20	10.90	10.70	11.15	11.50	12.80
Nitro: o/o of dry matter.	1.37	1.22	1.70	0.84	1.11	0.69	0.81	0.56

Composition of the ash.

Soda	1.48	3.12	.92	2.80	0.72	1.72	1.00	0.76
Chlorine	3.40	4.08	2.84	5.08	2.56	4.54	5.80	4.68
Lime	34.05	35.45	42.78	34.44	46.50	42.05	26.88	37.84
Phosphoric acid	2.85	2.65	4.57	2.04	2.94	2.42	2.14	2.97
Potash	12.34	8.22	8.65	12.92	7.56	8.76	25.24	12.49
	49.24	46.32	56.00	49.40	57.00	53.23	54.26	53.25
	guano kainit nitrog lime (2)	guano kainit nitrog no lime	guano coral nitrog kainit (1)	coral nitrog guano no potash	kainit coral nitrog guano (2)	nitrog coral kainit no guano	kainit coral guano leaf mould	leaf mould alone
Organic matter	1.05	1.14	1.08	1.34	1.13	1.11	1.21	1.33
Mineral matter	6.82	7.50	17.12	10.94	9.47	8.92	9.39	8.90
Water	92.13	91.36	91.80	87.72	89.40	89.97	89.40	89.80
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

In this series of analyses made it has been proved that the proportion of Potash is also sometimes high as well as that of lime, that the three elements lime, potash and phosphoric acid are absorbed by the vanilla vines under experiment in larger proportions when the food is given in the form of a complete manure that is to say, that these three elements reach a higher percentage in the ash of the vines treated than in the untreated vines ; that the same rule applies to Nitrogen, which is being absorbed in greater proportion when the manure is complete than when the manure is incomplete.

However there is a considerable variation in the proportion of each separate element in treated and untreated vines, and the only conclusion which can be deduced at present is that a high percentage of lime and potash appeared in the ash, nearly 50 o/o.

The other elements exist in small proportions and do not seem to have the same importance with regards to the food of the vanilla plant with the exception of Phosphoric acid, which curiously enough when applied in large quantities, seems to enable the vanilla vines not only to absorb a greater proportion of mineral food but also to contain a larger percentage of lime than when coral lime forms part of the manure instead of guano (Phosphate of Lime).

The great variation in the mineral elements contained in vanilla vines which have been planted at the same time in the same way in exactly the same soil, does not show any clear results of manuring by the analysis of the vines and it has been decided next year (1913) to start manuring on a large scale on estate plantations in order to determine the influence of the manure on the yield of the orchid without taking into account the variation in the composition of the vines (extensive plots).

But a curious feature of the analysis is the relative percentage of mineral matter (ash), water and organic matter found in the vine.

Dry matter	o/o	10.20
Water	o/o	89.80
		100.00

Dry matter	Mineral matter o/o of green vine ...	1.23
	Organic matter " " " ...	8.97

as compared in the composition of grasses which may be put down as being.—

Dry matter	o/o	14.30
Water	o/o	85.70
		100.00

Dry Matter	Mineral matter o/o of green grass ...	1.89
	Organic matter o/o " " ...	12.41

As the amount of Vanilla vine under good conditions of growth can be reckoned at a weight per acre which is nearly equivalent to a crop of grass (2 tons) one is entitled to deduce that the elements absorbed by vanilla from the air and from the soil (substratum) is nearly equivalent to the amount of food materials required by ordinary herbaceous plants.

Vanilla being a vine of considerable length and power of growth it is in many ways different from the ordinary orchids which only grow a few centimetres per annum and require only a few grammes of food elements for their growth.

Cattleya bulbs for example only contain 0·5 o/o of mineral matter instead of 1·21 o/o as in vanilla. Although the proportion of organic matter and dry matter is about the same as in vanilla it is therefore evident that the conclusions arrived at in Europe for the treatment of orchids may not apply with the same force to the culture of vanilla in the tropics.

Many orchids growers in Europe are very reluctant to employ chemical manures and also organic manures such as cowdung which bring about decay of the roots of the plants. A few specialists however have lately started employing mineral salts in solution with success and the best orchids growers are of opinion now that being given a good fibrous and porous soil where the delicate plants are rooted their growth is singularly improved by weak solutions of ammonium nitrate and ammonium phosphate. If this is so for ordinary orchids which contain such a small amount of mineral matter, it is evident that it applies with more force to the more exacting vanilla plants which no doubt in the natural state find a larger amount of plant food in the decayed organic matter which abounds in the crevices of the rocks and dead woods on which they grow as well as in the rain water of the tropics when so much nitrogen in the form of nitrates is found during the storms.

These facts should not be lost sight of for the proper treatment of vanilla vines and for the improvement of the soil.

Alternate layers of dry grasses, earth and lime, no doubt create the best medium for the growth of the orchid. It is not the lime alone which is responsible for the beneficial action but the combination of lime and grasses and earth (especially garden soil and burnt earth) which help to form that black mould which is so common in countries where decayed plants are mixed up with coral (lime) deposits.

Lime by itself is much dreaded by orchid growers in Europe, water containing lime being rejected for watering purposes, but the behaviour of the vanilla vines towards lime mixed up with organic matter developing nitrates seems to be different. This is a point on which much of the future of the industry depends. It now remains to be seen whether the influence of alternate dry and wet seasons on the flowering of the vines can be made good by the action of manures and proper treatment.

When a spell of dry weather causes the vines to mature during 2 or 3 months before the blossoming season (September) the flowering is always good. It is not in our power to change the climatic conditions which rule the flowering of orchids although a certain amount of exposure of roots and withdrawal of leaf mould manure at the right time may have some influence. But it is easy to understand that by improving the growth of the vines by a judicious manurial treatment for the whole of the year and especially for the whole time (3 years) during which the young vanilla vines have not reached the flowering stage a greater amount of food will accumulate in the vines and migrate towards the flowering buds when a good season for flowering arrives with a resultant improvement in the crop.

VIII.

The Rubber Industry.

Rs 2,265 worth of rubber was exported in 1912. About 50,000 seedlings were planted out this year bringing the total number of Para rubber plants growing in the Colony to about 184,000 and the total acreage to 1,082 acres. One more estate in South Mahé has started tapping this year on a small scale raising to four the total number of estates in full working order. Small estates possessing a few thousand trees are gradually reaching the tapping stage, the production however small being sold to the larger estates that have commenced tapping. There is therefore no difficulty in the way of tapping on all estates and I do not understand why two of the larger estates of the Colony, on which more than 3,000 trees have reached a tappable size, are still delaying the tapping operations. The reason given is that tapping will not be begun until at least 10,000 trees have reached the tappable size. In view of the slow growth of rubber trees in Seychelles and of the reduction in price which is likely to occur in the near future this does not seem to be a wise policy.

The variation in growth of the trees grown in Seychelles can be explained by the rocky nature of the ground and by the composition of the soils which are more or less good according to the number of Cassava crops (preceded by fresh fires and followed by erosion) raised on them. There is also such a great variety of granites of different grain and texture even in patches of a few square yards that the physical composition of the soil is very variable. The granites which decompose into friable soils produce more favourable land than the red stiff laterites resembling *augites* derived from granites of finer texture. It is not always easy to determine at first sight the physical composition of the soil but a good guide is the growth of the sub-spontaneous vegetation in those places where bracken ferns have not excluded other plants. For example in places where Albizzia trees (*Bois noir*) grow to a good size one is almost sure that the soil is of good composition whilst the presence of cinnamon with yellowish tinge points to unsuitable soil. But the soil has to be carefully examined acre by acre.

However the following table may serve to show the variation in growth of all trees in a given plantation started in the neighbourhood of the Botanic Station in 1906 and completed in 1907 :

Trees above 32 inches.	4
„ ” 28 „	33
„ „ 24 „	154
„ „ 20 „	434
„ „ 16 „	688
„ under 16 „	588

Total number of trees 1901
Trees of tappable size 1313
Percentage of trees of tappable size 69 o/o.

The smaller trees 31 o/o were those either choked (planted too closely 300 to the acre) by more vigorous neighbours or growing in the shade of cinnamon, sangdragon and other trees of a neighbouring estate.

This estate was not clean weeded but the soil was for the past two or three years kept under cover of velvet beans which kept down the weeds a good deal and the trees after that time produced enough shade to continue their good growth without sharing their food too much with the weeds. No manure of any sort was given to the trees which are planted 10/10 feet and 12/12 feet. In the rocky and poor soils of this colony it is better to plant at these short distances in order to thin out the badly tapped and backward trees as time goes on.

Much has been said lately about the unsuitability of Seychelles as a rubber growing country. This is not true because many trees have reached 3 feet in girth within 8 years when grown under proper conditions. A few plantations were made on old "cassava" land where no food is left for rubber and these plantations are very slow but it should be borne in mind that slow growing trees are more resistant to fungus diseases and that the texture of their bark leads to a better renewal. It should be added that for the years 1905–1911 during which nearly all the rubber plantations were started, the rainfall was defficient but on the estate next to the Botanic Station the following rate of growth of tapped trees during the year 1912 which was a wet year may serve to show by the annual increase of girth to what extent the climate and soil of this colony is suitable for rubber trees. I do not think that most Ceylon trees make better growth except in alluvial flats which do not exist in Seychelles.

Mode of tapping.	Girth of trees 18th December 1911. in.	Girth of trees 20th March 1913. in.	Number of trees tapped.
Full spiral ...	22	27	58
Half spiral ...	20	24	53
Quarter spiral..	21	26	75

The above remarks are made to show that a small place should be given to rubber in Seychelles, and that soils worn out by cassava should be avoided for planting rubber, the nature of the ground being easily ascertained by the subspontaneous vegetation of the jungle.

With regard to substitutes or overproduction, the best authorities think that the consumption and the production are both increasing simultaneously and that if in 1917 the production of plantation rubber amounts to the present consumption (100,000 tons) the consumption six years hence will reach 184,000 tons showing that the struggle between plantation and wild rubber does not appear to be imminent. The same may be said of substitutes although important discoveries were made during the year for a cheaper preparation of synthetic or rubber from starch. But the planting of rubber must be carried out in the same scientific spirit as the preparation of synthetic rubber and as a possible parallel it may be mentioned that the fate of synthetic rubber will perhaps be the fate of synthetic indigo which is beginning to be driven from the market by natural indigo prepared under modern principles.

IX.

Essential Oils and other Minor Industries.

Cinnamon bark which is mostly used for extraction of an essential oil was again exported this year instead of being distilled locally. The quantity exported amounted to 1098 tons of a declared value of Rs. 83,547 as against 963 tons exported in 1911. This industry will soon however decline, all the larger trees, except in a few localities and on Crown Lands, having been cut down. The smaller trees yield very little as compared with the large trees which possess thicker bark and a diameter often exceeding one foot. As much as 100 lbs of dried bark was obtained from veteran trees measuring 2 feet in diameter and a young tree 15 years of age will only yield about 10 lbs. The profit per acre is very small and I do not think that cultivating cinnamon trees for bark exportation will ever pay. But the above dimensions of some trees show that they are well adapted to the soil and climate besides their being easily propagated by birds, mostly the common Mynah (*Acridotheres tristis*), which is so fond of their seeds that, during the fruiting season (February—April), it neglects the other fruits like chillies found in the immediate neighbourhood of cinnamon trees. It is on this bird that the inhabitants count for the restocking of the jungle with cinnamon trees and as the profit per acre does not exceed Rs 20 for trees of about 10 years of age it is likely that no attempt at cultivation will be made unless quills are made when the wild bark has all been collected. The Ceylon process of planting cinnamon bushes and of making quills was described in my report for 1903. The seeds are sown in holes at the rate of 12 to a hole and the seedlings grown in clumps and transplanted 6 feet apart when they are 6 inches high. The sticks are harvested when about a year old but the stools take about 3 years to be properly pruned and arranged so as to form an even growth of sticks.

About 200 lbs of quills are obtained in Ceylon per acre and the price obtained is about 50 cts a pound. The cost of making quills is however high, skilled labourer being required. Attempts made here in Seychelles have shown that no more than one lb a day could be prepared by unskilled women. This means that the profit of cinnamon cultivation amounts to about Rs 40 per acre.

The distillation of cinnamon leaves and clove leaves is still carried out but this industry is also vanishing, the clove trees having been nearly all destroyed by the barbarous way of cutting the large branches instead of the terminal twigs in order to pick the flower buds which are also exported. These two trees have however also suffered from the drought and from its accompaniment of scale insects, mostly *Lecanium tessellatum*, which attacked the trees when they were in a feeble state after barking or heavy pruning. In up country places the harsh treatment of these two trees does not prevent them from recovering owing to the damp atmosphere and sufficient seedlings of both trees will at any time be available for planting, should it be found necessary in order to encourage new industries, to establish new plantations and grow the two trees in hedges for the distillation of leaves in much the same way as camphor leaves are now being distilled in the Far East.

Ylang Ylang trees were planted on a large scale 2 years ago but mostly in localities unsuited to them. Very few have made good growth, the trees growing in dry and stiff soils being attacked by a scale insect (*Asterolecanium*) and remaining stunted in growth. Trees on the sea side especially in sheltered valleys have done much better and reached an enormous size. The distillation of oil from the flowers of this tree has not yet emerged from the experimental stage.

A series of other oils, (1) Ceylon lemon grass (*Andropogon citratus*), (2) Cochin lemon grass (*Andropogon flexuosus*), (3) Ceylon citronella (*Andropogon nardus*), (4) Bigarades leaves (*Citrus limonellus*), (5) Cuscus or Vetiver (*Andropogon muricatus*) are being made in two of the three distilleries of Mahé and

Silhouette and the persons in charge have become acquainted with the various processes used to obtain so many different oils. Vetiver oil from roots was distilled this year on a small scale in West Mahé showing that most of the difficulties have been surmounted, the oils from these roots not being easy to obtain. As there is a great variety of other plants in reserve : lime trees, cardamons (Malabar and Mysore) Basil (*Ocymum basilicum* and other varieties) it is important that the various methods of distilling essential oils adopted in the distilleries in question should become well known to the public.

The quantity of various essentials oils exported in 1912 amounted to 2227 litres worth a declared value of Rs 7700.

Another plant which produces a valuable essential oil in the Island of Réunion has been found growing wild in many localities especially alongside Forêt Noire and Misère road above 1000 feet elevation where it has escaped from gardens of some well-to-do inhabitants in ancient times. This plant is *Hedychium Gardnerianum* (commonly called *Longouze*) which produces fragrant light yellow flowers in abundance. In Réunion these flowers are macerated in petrolum ethers which are afterwards distilled in vacuo the essential oils remaining in a concentrated semi-solid state and exported as such. This is a delicate process which cannot be adopted easily without technical knowledge and another type of installation as yet unknown in the Colony.

Other minor industries worth mentioning are :

Mangrove bark from Aldabra where a forest of 3000 acres capable of producing 50,000 tons of dried bark has been found to exist.

18 tons of this bark were exported in 1912.

Some cotton and cotton seeds of the indigenous species (*Gossypium purpurascens*) were exported to the value of about Rs 1100. This plant grows wild in a few islands of the archipelago and the cotton exported were gathered from these wild plants. There is very little ground in the archipelago suitable for this herbaceous plant but that it can be easily grown is shown from the fact that it becomes perennial in the rich coral islands containing guano deposits.

Citrate of lime has been made in Silhouette to the amount of 700 kilos worth a declared value of Rs 420. This industry has a bright future but the lime plants are badly attacked by two scale insects (*Lecanium viride* and *Aspidiotus ficus*) which reduce the crops considerably and unless the natural *fungoid* parasites which have appeared on the same keep them in check, there is little chance of the industry ever becoming established on a firm footing.

X.

Insect Notes.

In my Annual Report for 1911, I called the attention of planters to the parasitic fungi which made their appearance on scale insects in various localities mostly above 800 feet elevation.

These parasites have continued their good work and considerably relieved Para Rubber trees and coffee bushes from the scale insects which, especially in the latter case, had caused the destruction of a great many plantations. The scale insect on Para rubber is *Lecanium nigrum* which is parasited even in the low country by the *fungus* kindly identified by Mr Petch of Ceylon as *Hypocrella sp.* This lecanium also attacks *Hibiscus.*

Among other lecaniums found in this Colony I may mention :

Lecanium oleæ on ficus nautarum,
„ hesperidum on cassias.
„ tessalatum on coffee, coconut, cinnamon.
„ longulum on anonas.
„ frontale on casuarina.
„ viride on coffee, citrus and ixora, &c.

It is to be hoped that the *Hypocrella fungus* will spread on to the other species of lecanium.

Another *fungus* was found living on *lecanium viride* and appeared suddenly at the beginning of 1912, although the same species was brought over from Peradeniya in 1911 where it was found destroying the same scale insects on *Gardenia latifolia.* This fungus well known in the West Indies has been identified by Mr Petch as being *"Cephalosporium lecanii"*.

It belongs to the *Hyphomycete* or mould family and it has now spread to all parts of the Archipelago keeping in check the green scale to such an extent that it is a surprise to many planters to see now coffee bushes being restored to health in the most mysterious manner.

Attempts were made to propagate it at the Botanic Station in the low country.

During the rainy weather all the plants put under observation, coffee, ixoras, &c, in a shady place were immediately restored to health the scale insects having been destroyed in a few weeks by the fungus. But when it was decided to place the living fungus in the sun during the dry monsoon season (May—September) no scale insects to speak of were destroyed by the parasites which rapidly disappeared. I do not think it will ever be possible to spread this fungus in the low country except in exceptionnally wet years as 1912, but attempts should be continued to have it established in those localities where coffee is grown under shade and where this species of fungus might become acclimatised in the long run. In the up country districts, these useful parasites which have been shown to the interested parties in all localities, should be jealously guarded from destruction and transplanted from one locality to another following the track of the green scale.

The transplantation is so easily made by tying infested twigs to non-infested trees that the propagation of the fungus presents no difficulty. It is in these up country localities that citrus and coffee trees should be again planted for the benefit of those who formerly purchased coffee, limes, and oranges so cheaply.

But even in these localities a most careful examination of the indigenous jungle trees of the same family (*Rubiaceæ*) should be made and useless bushes such as café marron (*Randia sp.*) various *Psychotrias* (bois couleuvre), *Morinda citrifolia* (bois tortue) should be mercilessly destroyed in order to prevent the *lecanium viride* scale from getting more and more established on these plants to which they have already spread to a considerable extent.

Another fungus was identified as *Microcera sp.* on the small white scales (*Diaspis pentagona*) which attacks Flacourtia *(prunes)* pigeon pea (*ambrevadier*) and papaw (*Carica papaya*). It is one fungus of this family which was successfully propagated in Florida and used to control the white flies (*aleurodidæ*). Like the *Cephalosporium fungus* it requires I am afraid, the rainy weather to become practically useful and no planter in presence of so many parasitic diseases should neglect at the same time the destruction of scale insects by means of artificial means, i.e. spraying with insecticides.

The small black ant (*Technomyrmex albipes*) which is the commensal of the scale insects and materially assists them in their work of destruction is still very abundant in all localities. It has by itself become a plague on account of its depredations on household supplies. It should however be remembered that scale insects in the young stage are supplied with means of locomotion and that it is very common to see in Seychelles young *Iceryas* which are so conspicious crawling up the stems of Citrus and even Breadfruit trees. This year an attempt was made to destroy these ants by adopting two methods, one described by professor Woodworth of California, and the other which is more a preventive than a destructive measure and consists in tying paper bands glued with a patented mixture (Adhesite) to the stem of the trees infested with ants.

The Californian method employs a dilute solution of Arsenite of Soda in a syrup of sugar placed in receptacles in such a manner that the ants would get to it and carry it in a continuous supply to their nests, where it might be fed to queen and larvæ.

The receptacles were simply fruit jars with metal screw top, entrance being provided by means of small holes in the metal cover. These jars were placed in situations where the ants were known to be abundant. During the experiments repeated by many planters, it was found that the receptables were visited sometimes with the result that the ants were soon destroyed or disappeared from the spot under observation. It was however found that the number of ants which visited the jars was a mere bagatelle in comparison with the myriads of insects which passed near the jars without taking any notice of them. For this reason the entrance of the jars was not efficient enough and a planter found it more convenient to use a small bottle containing the poisoned syrup placed over a piece of glass upside down with a wire attachment to the neck of the small bottle in order to allow only a small quantity of syrup to ooze out at a time. It was found however that although this arrangement caused a much larger number of ants to be attracted to the syrup, yet it partially failed owing to the fact that part of the syrup being exposed to rain soon caused the bottle to be deprived of its contents by osmotic action and cappilarity, the rain gradually diluting and taking the place of the syrup. For this reason much of the syrup was wasted, not counting the waste caused by accident, the bottles readily toppling over by wind or light shock in their inverted position. A good arrangement for inducing the ants to eat the poisoned bait still remains to be found but there is no doubt that, in spite of these creatures nesting in crevices and holes in all sorts of trees and being capable of parthenogenetic reproduction, the poison used in the above manner was found very effective against them. Bananas are the ideal plants for propagation of ants owing to their enormous and sheating leaves with so many places of refuge and I have seen clumps of these and other bushy plants being rapidly cleared of the ants to which the poisoned syrup was distributed.

The use of paper bands and adhesite was found very efficacious and His Excellency the Governor has decided to introduce a fairly large quantity of these articles for distribution at cost price to planters. The adhesive substance costs only about R. 1 per kilo and the paper bands about the same price per two hundred trees and during the dry weather the same bands and adhesite can serve for a fortnight. In the rainy weather new bands must be applied weekly. All fruit trees can be protected in this manner and at the Botanic Station various Citrus trees which had not borne fruits for a long time, owing to the attack of scale insects assisted by the ant, are again producing a crop of fruits after 3 months' constant use of the adhesite. This is a well known method in Europe where carterpillars are prevented from crawling up trees by a similar contrivance.

In connection with mosquito larvæ (mostly *Stegomyas*) an experiment was made at Government House with the local small fish called *goujon* (*Haplochilus playfairi*) which is little different in action from the celebrated "Million" fish of Barbados (*Girardinus pœciloides*). In a small basin where mosquito larvæ were teeming 50 goujons were introduced one afternoon and the next morning not a single larva was found and none has ever been found since while the small fish after two months started to multiply considerably. This experiment may serve to show that we are possessed of a powerful enemy to mosquitoes, the small fish being able to live in the smallest pond. This is a little reassuring in view of the possible introduction of mosquitoes from Zanzibar which is four days' journey from Seychelles.

XI

Fisheries.

The exports from the Outlying Islands amounted to :—

Produce	Quantity	Declared value
Tortoise shell	kilos 1,163	Rs 35,025
Salt fish	„ 20,749	6,949
Calipee	„ 16,762	23,547
Trepang	„ 2,828	817
Turtle bones	„ 7,141	142
Salted turtle	„ ...	...
Shark oil	„ 119	50
Turtle oil	„ 273	273
Green-turtle shell	„ 2,300	876
Shark fins	„ 1,087	615
Mother o'pearl	cases 3	122
Whale oil	gallons 32,625	48,000
		Rs 116,416

The other resources of the Outlying Islands are mangrove bark, exported to the amount of Rs 8593 and guano worth Rs 465,414. These figures go to show that already one-third of the total value of exports is derived from these islands and submerged coral banks of the Archipelago, which extend over seven or eight thousand square miles.

A much greater return could be obtained from these natural resources, and it is to be hoped that part of the money invested in the exportation of guano will be devoted to the development of new industries, when all the merchantable guano, i.e., guano containing 0·5 o/o of nitrogen and over 55 o/o of phosphate of lime and less than 3 o/o of oxides of iron and alumina, has been exported. Guanos of lower grades cannot be exported as such, and it would not pay to export them as phosphates. These guanos will always serve as a reserve for agricultural purposes, and there is no reason why they should not be largely employed to render fertile the granitic soils of the larger islands, which are precisely deficient in phosphates and lime.

An attempt was made in 1911 to start fishing with a steam launch and a few modern appliances, but after two months successful experiments the firm engaged in it, from causes not connected with their fishing operations, went bankrupt and the experiment has not been repeated since then. The firm invested only Rs 12,500 in the fishing operations and supplied the market with fresh fish. About the same amount was reserved for the preparation of salt fish during the calm season. At this time migratory fish come over to the Seychelles in large schools, and there is no doubt that Mackerel (*Lethrinus mœnsii*) and Carangue Balo (*Caranx gymnostithoides*) not to speak of Bonite (*Thynnus thunnina*) would supply a factory of salt fish working for some part of each year. There is also no reason why the fishing of sharks should not be contemplated, as these predatory animals not only prevent to some extent fishing on the shallow reef flats, surrounding the islands, but they also destroy countless numbers of mackerel, sardines, &c., which only reach the inshore waters after having been their prey, as shown by the way in which schools of mackerel are disturbed and scattered about. That the destruction of sharks would be beneficial to the other fishing operations cannot be doubted, and being given a market for shark fins and shark oil, and the local demand for dried shark flesh, it would be advantageous to reduce the number of these voracious animals. Fishing with nets as in South India should be preferred to other methods of fishing. South Indian fishermen under an experienced headman should, I think, be recruited to give demonstrations of their methods, which, no doubt, would be at once adopted by the Seychellois.

In favour of caret (hawksbill turtle) raising may be cited the experience of The Mahé Syndicate Ltd., which owns several parks in the Alphonse Group. 10 carets 7 to 9 years old, put in park 6 years ago, gave the following yield of shell :—

Shell	kil.	7.125
Hoofs	,,	1.960
Plastrons... ...	,,	1.825
		10.910

10.910 for the ten, or more than 1 kilo per caret in 8 years. 9 carets taken in the ordinary way at the same time gave the following results :—

Shell	kil.	12.880
Hoofs	,,	4.525
Plastrons... ...	,,	1.920
		19.325

19.325 for the nine, or about double the yield of shells (kil. 2.148). A great difference was seen in the thickness of the shells and not in the size of the carets. This is probably due to age. Three kilos appear to be the maximum yield of a caret.

The young carets reared at Alphonse produced shell of the same value as the carets taken in the ordinary way, and therefore the question of bringing carets to a commercial size in less than 10 years has been solved. The carets were fed on jellyfish, fish, and shellfish, but various things go to show that these turtles feed also on special seaweeds and sponges, as shown by the contents of their stomach.

It is therefore evident that the best methods of raising carets should be demonstrated by more systematic experiments than those which can be performed spasmodically by the owners of the parks. Fishing is difficult at certain seasons of the year, and it is not always possible to obtain the quantity of fish, salted or not, necessary for the rearing of several thousands of small carets (about 2 lbs for each caret under two years, and the quantity doubling every year until the 6th year). They should be fed with other sea organisms and weeds as well, but experiments have to be made in order to determine what seaweeds can be made use of. The question is rather important as the point is not yet settled, to my knowledge, as to whether the carets are migratory animals or not, and whether they live in continental waters on the coast of Africa and come only to the Seychelles Islands to lay their eggs. If that is so, whether the food of the carets during the breeding season is the same as that obtained when they live in their natural habitat. Most people believe here that the other turtle (*Chelone mydas*) migrate from East Africa to Seychelles, and that they are more common at certain seasons of the year round the Outlying Islands. It is well known that at Aldabra in September, October and November, the turtles off Picard Island number thousands, but that they disappear soon afterwards.

There are other weeds and organisms, like *Gelidium, Medusae, Holothurians* (Trepang), &c., with which the local fishermen are not sufficiently acquainted. There is little doubt that systematic experiments should be made in order to disclose the importance of these resources and the readiness with which some of them, like seaweeds, are transformed into articles of food and transportation. It should be made known how fishes depend on other organisms, seaweeds and phankton (*diatoms*) for their food and the necessary connection between each of these organisms. It is not generally known that *medusae* live on small fish and that *medusae* serves as food for some of the larger fishes. Many fishermen think that the young *holothurians* (Trepang) are not found in the archipelago they having seen the mature ones only. This is apparently because the appearance of the young *holothurian* is in shape and in colour different at different ages or that they are eaten by large fishes.

The time has passed when the sea organisms were not sufficiently known to serve as a guide to fishermen. The moment has arrived to start marine industries in our archipelago where there is such a large area occupied by seaweeds of all sorts, where the numerous deposits of guano are gradually washed down to the sea by the rains, where the numerous currents in the sea may explain to a certain extent the direction taken by the shoal of fishes which visit our waters. The decomposed weeds and the particles of guano form the food of the phankton (small sea organisms) which in its turn serves as food for the larger organisms and fishes. It is by studying the connection of these elements with the appearance and disappearance of fishes in certain countries that most fishing industries have been developed.

XII.

Crown Lands.

No Crown Lands has been leased or sold during the year : except Crown land Pointe Zanguilles, Praslin (30 acres) which was leased to Mrs Widow Adam. The lease was given up by that lessee but was taken up immediately afterwards by Mr. L. J. R. Dubignon on the recommendation of the J. P. Praslin. Crown land Newcome (82 acres) was also given up by Mr Pothin who remains lessee of the adjacent Crown land Savoie (80 acres).

Newcome was temporarily placed in charge of the guardian of Crown lands (Sergt. Naud Albert) and will eventually be leased if a reliable lessee is found.

It is proposed to lease that land which is inferior to several small settlers in accordance with the scheme adopted for Fond Azor Crown land which has been subdivided into 20 acres plots. The time has arrived I think for settling proprietory cultivators on these Crown lands instead of leasing them to neighbourhood proprietors who are unable or disinclined to cultivate them to their full extent.

A scheme should be adopted on the lines of the land settlement of St Vincent by which these small proprietory cultivators can acquire 5 or 10 acre plots, by paying 25 o/o of their value during the first five years and the remaining parts by annual instalments, allowing sixteen years to complete the purchase of the land. Encouragement is given to these cultivators in St Vincent by Government Officials who advise them as to the way in which the land is to be cultivated and the products handled for market. There are several hundreds of acres of Crown lands which could be devoted to the settlement of the creole population as small holders in Mahé and Praslin.

The central plateau of Mahé (about 2000 acres) above 1500 feet elevation purchased and exchanged for about Rs 25,000 in 1909 and 1910 is being gradually reafforested. The following plants have been set out during the year :

Vateria Seychellarum (Bois de fer)	50
Milletia atropurpurea	310
Casuarina equisetifolia	910
Parkia Roxburghi	507
Borassus flabelliformis (Palmyra palm)	24
Northea Seychellarum (Capucin)	70
Stevensonia grandifolia (palm)	300
Azadarichta indica (from S. India)	437
Chrysobolanus icaco (Cocoplum)	700
Various fruit trees	74
Heritiera littoralis (Bois de table)	500
Melia dubia (from Ceylon)	50
Tecoma leucoxylon (Calice du Pape)	1,009
Hevea Brasiliensis (Para Rubber)	40
Pentadesma butyracea (Butter tree from Sierra Leone)	73
Oroxylon indicum (from Java)	62
Sandoricum indicum (from Ceylon)	200
Pterocarpus indicus (Sang dragon)	173
Cesalpinia Corarria (dividiri)	112
Garcinia Cambogia (from Ceylon)	81
Oil Palm (Eloeis guineensis) from Sierra Leone ...	50
	5,732

The open spaces which are occupied by bracken ferns (*Gleichenia dichtona*) are being gradually cleared as they prevent the germination of seeds and the spreading of trees by natural reproduction. The most promising plants for reafforestation are *Parkia, Albizzia* and *Melia dubia* for good soils and for worn out soils *Gliricidia maculata, Casuarina equisetifolia, Tecoma leucoxylon* and *Chryobolamus icaco,* the two latter species being also interplanted between *Parkias* and *Albizzias.*

P. R. DUPONT,

Curator, Botanic Station.

Seychelles, 31st March 1912.

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